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December 17, 1993

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Building The Wireless Future

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1991 M Street, N.W. Room 222
Washington, D.C. 20554

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Re: Ex Parte Filing
Docket No. 93-252 (Regulatory Parity)

Dear Mr. Caton:

This is to note that on December 17, 1993, per her request, the Cellular Telecommunications Industry Association ("CTIA") sent to Judy Argentieri, of the Tariff Division, a copy of the attached pages excerpted from "The Geodesic Network II: 1993 Report on Competition in the Telephone Industry," and the attached "Report of the Bell Companies on Competition in Wireless Telecommunications Services, 1991."

The views expressed in these documents reflect CTIA's position as previously filed in this proceeding.

If there are any questions in this regard, please contact the undersigned.

Sincerely,

Robert F. Roche

Attachment

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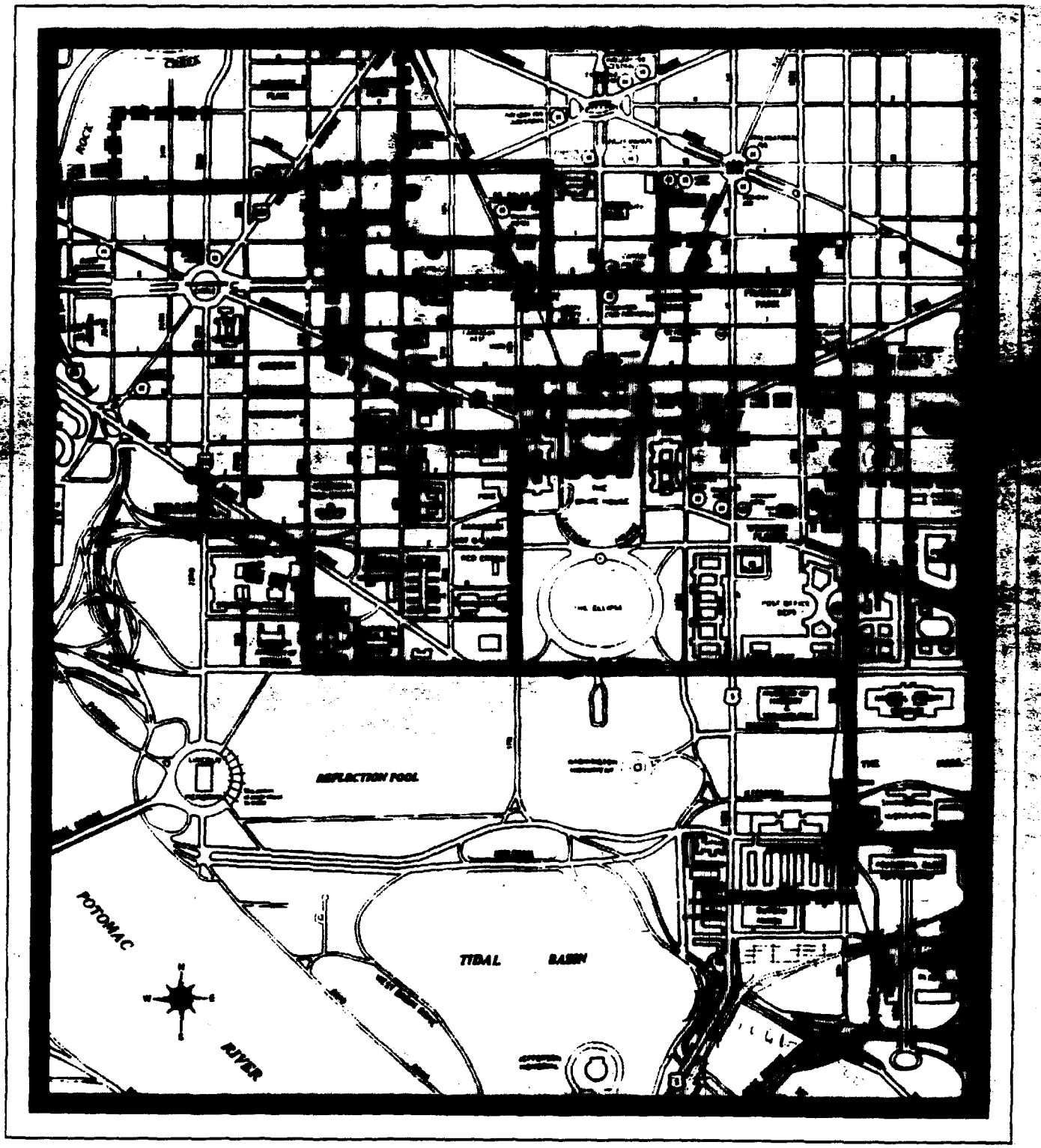
List ABCDE

Peter W. Huber
Michael K. Kellogg
John Thorne

The Geodesic Network II
1993 Report on Competition in the Telephone Industry



THE GEODESIC NETWORK II:

1993 REPORT ON COMPETITION IN THE TELEPHONE INDUSTRY

Peter W. Huber, Michael K. Kellogg, and John Thorne

require either additional spectrum or additional hardware (more transmitters, for example). Long-run average costs do not decline with volume indefinitely, and a much larger fraction of costs are incurred only as demand dictates. Whether or not some landline services were or are natural monopolies, radio services are not.

The FCC has long recognized these differences. While the Commission accepted, and for many years encouraged, the monopoly provision of landline services, it has consistently promoted competition in the provision of radio services. As discussed in section B of this chapter, these policies have succeeded admirably. Competitive performance in radio services is robust, characterized by vigorous technological innovation, rapidly declining price, soaring demand on the consumer side, and frequent new entry among producers.

In the view of the FCC and most state regulators, the success of the Commission's procompetitive policies has made it unnecessary to tariff radio services themselves. Accordingly, the FCC, in tandem with most state regulatory commissions, does not regulate the price of radio services, nor the enhancements that may be added to these services, nor the geographic scope over which such services may be coordinated or combined. Instead, market forces have been permitted to determine price, the geographic scope of coverage, the methods and facilities used to achieve intersystem coordination, and all manner of other enhancements. The divestiture decree, however, imposes a fundamentally different and inconsistent set of demands and restrictions on the provision of radio services by the seven Regional Bell Holding companies (RHCs).

1. FCC Policies

The FCC's oversight of radio services is defined as much by what is not regulated as by what is. The allocation of radio spectrum is of course overseen by the FCC. So too is the radio carrier's right to interconnect with the landline network. Both of these regulatory functions have been shaped, however, to promote vigorous competition among independent and telco-affiliated providers of radio services. As a result, the FCC, joined by most state regulators, has found it unnecessary to extend regulation into the competitive domain of radio services themselves.

Spectrum Allocation. When it first allocated frequencies for land mobile services in 1949, the Commission allocated separate blocks to telcos and to "miscellaneous" or "limited" common carriers ("MCCs").[13] The FCC itself would later describe this as "one of the Commission's first procompetitive policies," expressly designed "to protect the fledgling radio common carrier industry from

[13] 13 F.C.C. 1190, 1228 (1949). The Commission defined a "miscellaneous common carrier" as one "not engaged in the business of providing either a public landline message telephone service or public message telegraph service." *In re* ITT Mobile Telephone, Inc., 1 Rad. Reg.2d (P & F) 957, 959 n.2 (1963). The term "radio common carrier" ("RCC") subsequently attained more common usage.

2. Cellular Telephony

In 1982, cellular telephone service was still not a market reality. Just five years earlier, the FCC had granted Illinois Bell's application to construct a developmental cellular system in Chicago.[90] The FCC awarded a second developmental license to American Radio Telephone Service (a subsidiary of Motorola) in 1977 to operate in the Washington, D.C.-Baltimore area.[91] But the FCC did not finalize its guidelines for cellular service until March 1982, three months after the Department of Justice and AT&T announced their divestiture agreement. In 1982, AT&T estimated that by 1990 the cellular market would be serving 1.5 million customers.[92] The actual number turned out to be more than three times higher.[93]

In 1984, when divestiture actually occurred, the cellular telephone market was in its infancy. Only 32 systems had been licensed; they served some 92,000 customers. Even as of November 1985, almost two years after divestiture, there were no more than 200,000 cellular subscribers nationwide.[94] The average LATA, by contrast, served about 500,000 landline subscribers.

The cellular industry passed the million-customer mark in 1987,[95] and growth has accelerated ever since. By June 1991, there were over 6.3 million cellular subscribers in the United States, almost a million of which had first subscribed in the first six months of 1990.[96] More new customers subscribed to cellular service in the first half of 1992 than in any prior six-month period.[97] **TABLE 4.4, FIGURE 4.3.** During

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[90]Application of Illinois Bell Tel. Co., 63 F.C.C.2d 655 (1977), *aff'd sub nom.* Rogers Radio Communication Services, Inc. v. FCC, 593 F.2d 1225 (D.C. Cir. 1978). Two years later the FCC expressly authorized Illinois Bell to offer commercial cellular service to the public. Telocator Network of America v. Illinois Bell Tel. Co., 70 F.C.C.2d 713, 716-717 (1979).

[91]American Radio Tel. Serv. Inc., 66 F.C.C.2d 481 (1977). The FCC apparently did not issue any other developmental licenses. *See* McGuigan, Connors & Cannon, *Cellular Mobile Radio Telecommunications: Regulating an Emerging Industry*, 1983 B.Y.U. L. REV. 305, 314 n.42 (citing Inquiry Into the Use of Certain Frequency Bands for Cellular Communications Sys., 46 Fed. Reg. 27,655, 27,656 & n.8 (1981)).

[92]Hardin, *Cellular Mobile Phone Fight Starts*, ELECTRONICS, Jan. 13, 1982, at 97.

[93]CTIA, STATE OF THE CELLULAR INDUSTRY 4 (Spring 1990).

[94]*See* United States v. Western Elec. Co., 1986-1 Trade Cas. (CCH) ¶ 66,987, at 62,055, 62,057 (D.D.C. 1986).

[95]*Busy Signal a Welcome Sign in Cellular Telephone Industry*, CHICAGO TRIBUNE, Oct. 18, 1987, at C10.

[96]CTIA, DATA SURVEY THROUGH JUNE 1991 (Sept. 9, 1991).

[97]CTIA, DATA SURVEY THROUGH JUNE 1992 (Sept. 8, 1992).

Table 4.4. Growth of the Cellular Industry.[98]									
	1984	1985	1986	1987	1988	1989	1990	1991	1992
Subscribers (thousands)	92	340	682	1,231	2,069	3,509	5,283	7,557	8,892
Systems	32	102	166	312	517	584	751	1,029	1,483
Cell Sites	346	913	1,531	2,305	3,209	4,169	5,616	6,685	8,901
Revenue ($ millions)	178	482	823	1,152	1,960	3,341	4,549	5,708	7,809*
* Estimated revenue projection based on figures through second quarter 1992.									

this same period, the price of cellular telephones has dropped seven-fold; the inflation-adjusted price of equipment and service combined has dropped by more than 50 percent, according to estimates by the Eastern Research Corporation.[99] According to the *1991 U.S. Industrial Outlook*, "[t]he cost of local cellular service declined 6 percent in 1990," while the average length of a call remained about the same (2.3 minutes).[100] **FIGURE 4.4.** Today's cellular subscriber count is 8.9 million.[101]

Today, McCaw Cellular is, by almost any measure, the largest cellular telephone company in the United States, and indeed in the world. GTE/Contel ranks second. McCaw and GTE both overshadow even the largest Bell company affiliate, and they are first and second in terms of subscribers served, markets owned, and cellular revenues.[102] McCaw and GTE/Contel also lead the pack in the number of cities they serve. **TABLE 4.5, FIGURE 4.5.** Even a smaller non-RHC company such as Centel has cellular operations comparable in scope to those of the smaller RHCs.[103] The independents, taken together, serve almost half of U.S. cellular subscribers.

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[98]CTIA, DATA SURVEY THROUGH JUNE 1992.

[99]EASTERN RESEARCH CORP., CELLULAR TELEPHONES: THE NEXT FIVE YEARS 27 (1989) (Table showing "full effective costs of cellular service adjusted for inflation." Note, however, that percentages in last column of table fail to sufficiently adjust for inflation, utilizing a less than 50 percent adjustment between 1983 and 1989.).

[100]DEP'T OF COMMERCE, 1991 U.S. INDUSTRIAL OUTLOOK 31-8 (1991).

[101]CTIA, DATA SURVEY THROUGH JUNE 1992.

[102]*GTE-Contel Merger Creates USA's Second-largest Cellular Operator,* FINTECH MOBILE COMMUNICATIONS, July 19, 1990.

[103]Centel's cellular presence will be substantially enhanced when (and if) it completes its announced merger with Sprint (formerly United Telecom). Sprint has cellular interests in 27 RSAs. *Centel, Sprint File in Nevada for State Regulatory Approval of Merger,* BUSINESS WIRE, Sept. 15, 1992.

tion process, McCaw purchased 60,000 new cellular phones from Ericsson GE and Hughes Network Systems, Inc. that can accept both analog and digital systems.[511]

Ameritech recently announced that it will test both TDMA and CDMA to decide which best serves the needs of its mobile customers.[512] GTE assisted Qualcomm, Inc. in testing CDMA in July 1991,[513] and Alltel Mobile recently signed an agreement with Motorola Nortel[514] to upgrade its network for a full conversion to digital, with service available by 1995.[515] Bell Mobility Cellular Inc. also has a contract for digital radio technology with Motorola Nortel; its system in Ontario and Quebec should be completed in early 1993.[516]

The third source of new supply is new spectrum allocation by the FCC for radio services of all kinds. Soon to arrive on the U.S. market (and already on the market in Britain) are two-way paging systems, capable of acknowledging the receipt of messages and transmitting return data, including low-speed fax.[517] Bridging the capabilities of current cellular and one-way pagers, two-way paging systems will offer new competition to both services.[518]

In 1991, the FCC opened up a new competitive door to cellular service, when it authorized Fleet Call, a radio dispatch company, to use its spectrum to operate mobile telephone services in six cities and made it clear that it would approve similar

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[511] *McCaw to Buy New Phones for its Digital Conversion,* SEATTLE TIMES, Apr. 21, 1992, at C4.

[512] *Ameritech Mobile First in Industry to Trial Two Digital Technologies,* PR NEWSWIRE, Aug. 17, 1992.

[513] *GTE Announces Participation in Validation Test of CDMA,* NEW DIGITAL TECHNOLOGY, July 17, 1991.

[514] Motorola Nortel is a joint venture between Motorola and Northern Telecom to manufacture advanced digital cellular switches and equipment.

[515] *ALLTEL Positions Cellular Network for Growth; Signs Agreement for Multi-million Dollar Upgrade,* BUSINESS WIRE, Sept. 22, 1992.

[516] Anne Crawford, *So Long Analog, Welcome Digital for the Nineties,* CALGARY HERALD, Sept. 11, 1992, at E3.

[517] Kewney, *The Clever Pager That Answers Back; A Two-way System Will Solve the Problem of Missing Messages,* THE INDEPENDENT, Nov. 5, 1990, at 16.

[518] FCC licenses in the 150 and 450 MHz ranges permit two-way paging as well as other two-way uses. Most are still currently used for one-way services, but the FCC sees "a strong possibility that two-way digital, data applications, and confirmatory paging services will increase in the near future." *See* 47 C.F.R. § 22.501(b); 4 F.C.C. Rcd at 1580.

applications for other areas.[519] Fleet Call plans to build systems in New York, San Francisco, Los Angeles, Chicago, Houston, and Dallas. The Los Angeles system is expected to begin operating in early 1993.[520] Other companies have followed Fleet Call's lead. In early 1991, Mobile Communications Network, a coalition of SMR operators, was moving to offer wide-area dispatch, interconnect services, and roaming over large areas in Florida by mid-1991, with plans to provide competitive service throughout the entire state of Florida.[521] Similarly, Millicom has purchased several SMR licenses in Florida, Phoenix, and Atlanta and "plans to develop a future radiotelephone network" that will "challenge established cellular service." J. Shelby Bryan, chairman and CEO of Millicom, billed the SMR-based network as a "lower priced alternative to cellular."[522]

"Personal Communications Services" (PCS) serve "microcells" on microwave frequencies with very small, low power, digital transmitter-receivers to provide mobile service over small areas -- an office building or neighborhood.[523] As of July 1992, the FCC had already issued more than 150 experimental licenses to test PCS.[524] Millicom, for example, will construct PCS networks in Houston, Texas and Orlando, Florida which will have handoff capabilities, and of course connect to the switched

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[519]Andrews, *FCC Acts on Cellular Competition*, N.Y. TIMES, Feb. 14, 1991, at D1, col. 3; *In re* Fleet Call, Inc., 68 Rad. Reg.2d (P & F) 1301 (1991).

[520]68 Rad. Reg.2d 1301.

[521]*Mobile Comnet to Institute Wide Area Network Across Florida,* INDUSTRIAL COMMUNICATIONS, Mar. 1, 1991, at 1; COMMUNICATIONS DAILY, Mar. 6, 1991, at 9.

[522]*Millicom Confirms Reports it Plans Radio Network to Challenge Cellular,* INDUSTRIAL COMMUNICATIONS, Mar. 23, 1990, at 3.

[523]*See* Amendment of the Commission's Rules to Establish New Personal Communications Services, 5 F.C.C. Rcd 3995, 3996 (1990). The FCC has stated its intention to "broadly define personal communications services and make available an adequate amount of spectrum to foster the development of innovative and competitive markets for these services" and has tentatively decided to allocate microwave frequencies for this purpose. Policy Statement and Order at 2, Amendment of the Commission's Rules to Establish New Personal Communications Services, No. 90-314 (FCC Oct. 25, 1991); *see also* 5 F.C.C. Rcd 3995.

[524]More than one hundred of these licenses have been awarded in the nine months since March 1991.

REPORT OF THE BELL COMPANIES ON COMPETITION IN WIRELESS TELECOMMUNICATIONS SERVICES, 1991

October 31, 1991

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FIGURES

MAPS

MAPS (continued)

INTRODUCTION: THE REGULATORY CONTEXT

The economics of radio telecommunications services differ fundamentally from the economics of landline services. Landlines are dedicated resources; a fixed investment creates a fixed transmission capacity that may lie idle much of the time. This creates large economies of scale. The airwaves, by contrast, are shared. Additional users require either additional spectrum or additional hardware (more transmitters, for example) that adds cost, but long-run average costs do not decline with volume indefinitely. Whether or not some landline services were or are natural monopolies, radio services are not.

The FCC has long recognized these differences and has accordingly regulated the services quite differently. While the Commission accepted, and for many years encouraged, the monopoly provision of landline services, it has consistently promoted competition in the provision of radio services. As discussed in chapter 1 of this report, these policies have succeeded beyond all expectation. Competitive performance in radio services is robust, characterized by vigorous technological innovation, rapidly declining price, soaring demand on the consumer side, and frequent new entry among producers.

In the view of the FCC and most state regulators, the success of the Commission's procompetitive policies has made it unnecessary to tariff radio services themselves. As discussed in detail in chapters 2 and 3 of this report, the FCC, joined by most state regulatory commissions, does not regulate the price of radio services, nor the enhancements that may be added to these services, nor the geographic scope over which such services may be coordinated or combined. Instead, market forces have been permitted to determine price, the geographic scope of coverage, the methods and facilities used to achieve intersystem coordination, and all manner of other enhancements.

The divestiture decree, however, imposes a fundamentally different and inconsistent set of demands and restrictions on seven important (though by no means dominant) players in the crowded, competitive field of the radio services industry. As licensing has progressed and the industry has grown in the last several years, the divestiture decree has become a significant impediment to the full realization of the procompetitive policies fashioned by the FCC.

FCC Policies

The FCC's oversight of radio services is defined as much by what is not regulated as by what is. The allocation of radio spectrum is of course overseen by the FCC. So too is the radio carrier's right to interconnect with the landline network. Both of these important regulatory functions have been shaped, however, to promote vigorous competition among independent and telco-affiliated providers of radio services. As a result, the FCC, joined by most state regulators, has found it unnecessary to extend regulation into the competitive domain of radio services themselves.

From the earliest days of commercial mobile services, the FCC has taken the position that radio services could -- and should -- be competitive. George Calhoun summarizes this aspect of the regulatory history in his *Digital Cellular Radio*:

> Right from the beginning, against AT&T's pleadings, the FCC had decided to authorize independent operators to offer mobile telephone service. The argument that telecommunication is a "natural monopoly" did not seem to hold in the realm of radio, where there was no expensive fixed-wire plant to construct. Competition in the broadcast side of the radio world was vigorous, to say the least. Thus the FCC felt that competition could and should be allowed in mobile radio.[1]

Spectrum Allocation. When it first allocated frequencies for land mobile services in 1949,[2] the Commission allocated separate blocks to telcos and to "miscellaneous" or "limited" common carriers ("MCCs").[3] The FCC itself would later describe this as "one of the Commission's first procompetitive policies," expressly designed "to protect the fledgling radio common carrier industry from telephone companies being licensed on all or most of the new mobile frequencies."[4] In a 1983 order, the Commission reaffirmed this policy and kept in place its rule barring wirelines from acquiring or using frequencies assigned to others.[5] "[T]he establishment of separate frequency blocks was designed to foster competition" between wirelines and non-wirelines, the Commission explained, and the experience since 1949 has been "salutary."[6] In 1987, the Commission even briefly considered adopting a policy to exclude telcos from the new mobile markets

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[1] G. CALHOUN, DIGITAL CELLULAR RADIO 35 (1988).

[2] General Mobile Radio Serv. Allocation of Frequencies Between 25 & 30 Megacycles, 13 F.C.C. 1190 (1949).

[3] *Id.* at 1228. The Commission defined a "miscellaneous common carrier" as one "not engaged in the business of providing either a public landline message telephone service or public message telegraph service." *In re* ITT Mobile Telephone, Inc., 1 Rad. Reg. 2d (P & F) 957, 959 n.2 (Nov. 21, 1963). The term "radio common carrier" ("RCC") subsequently attained more common usage.

[4] Amendment of the Commission's Rules to Allow the Selection from Among Mutually Exclusive Competing Cellular Applications Using Random Selection or Lotteries Instead of Comparative Hearings, 98 F.C.C.2d 175 198 (1984).

[5] *Ibid.*

[6] 1 Rad. Reg. 2d (P & F) at 963.

[7] *Ibid.*

altogether,[8] but ultimately declined to impose such a quarantine.[9] In a 1968 order, the FCC noted that "development of competing systems, techniques and equipment has been fostered by the Commission since as far back as April 1949 * * *. The Bell System, independent telephone companies and MCC's have accordingly been operating in competition throughout this period."[10] By that time, "there were more than 500 [radio common carriers that] together * * * served almost as many mobile customers as AT&T."[11]

In 1970, the Commission again split the allocation of new frequencies between telcos and non-wirelines, and expressed the hope that "AT&T, as well as others" would aggressively develop new services.[12] In 1971, the FCC set aside additional frequencies for "domestic public land mobile radio services" and announced that they would be awarded on an "open entry" basis to the best applicants. The FCC considered and rejected the argument (from already established carriers) that "ruinous competition" might result.[13] In 1981, when the Commission decided to license two systems for every cellular service area, it noted that competition "will foster important public benefits of diversity of technology, service and price, which should not be sacrificed absent some compelling reason."[14] The FCC reassessed its licensing policies in 1984 and again

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[8]The Commission raised the question whether "the public interest [would] better be served by not making any assignment of [mobile] frequencies to wireline carriers." Amendment of Part 21 of the Commission's Rules with Respect to the 150.8-162 Mc/s Band to Allocate Presently Unassignable Spectrum to the Domestic Pub. Land Mobile Radio Serv. by Adjustment of Certain of the Band Edges, 9 F.C.C.2d 659, 664 (1967).

[9]Amendment of Part 21 of the Commission's Rules With Respect to the 150.8-162 Mc/s Band to Allocate Presently Unassignable Spectrum to the Domestic Pub. Land Mobile Radio Serv. by Adjustment of Certain of the Band Edges, 12 F.C.C.2d 841, *reconsideration denied*, 14 F.C.C.2d 269 (1968), *aff'd sub nom.*, Radio Relay Corp. v. FCC, 409 F.2d 322 (2d Cir. 1969).

[10]14 F.C.C.2d at 271.

[11]G. CALHOUN, *supra*, at 51.

[12]*In re* An Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz, 19 Rad. Reg. 2d (P & F) 1663, 1676-1677 (May 21, 1970).

[13]Amendment of Parts 21, 89, 91 & 93 of the Rules to Reflect the Availability of Land Mobile Channels in the 470-512 MHz Band in the Ten Largest Urbanized Areas of the United States, 30 F.C.C.2d 221, 234 (1971).

[14]An Inquiry Into the Use of Bands 825-845 MHz & 870-890 MHz for Cellular Communications Sys., 86 F.C.C.2d 469, 478 (1981). For a brief period during 1974, the FCC had concluded that cellular phone service should be provided only by established telcos. An Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz, 46 F.C.C.2d 752, 780 (1974). The FCC explained that "the wireline carriers are the only organizations which have demonstrated that they possess the resources and the expertise necessary to establish cellular systems which would have nationwide compatibility." *Ibid.* The Commission anticipated that it would apply full common carrier type regulation to the "large cellular land mobile radio systems." *Id* at 782. Within a year, however, the FCC began backing away from this no-competition decision. First, the

concluded that they had "resulted in a highly competitive market structure in which two carriers with different histories and different approaches vie with one another in the marketplace."[15]

Equal Interconnection. To ensure that competition between wireline and non-wireline mobile carriers would develop fully and fairly, the FCC has required telcos to provide non-wireline carriers with interconnection equal in type, quality, and price to that provided to the telcos' wireline affiliates. Over two decades ago, in a 1968 paging proceeding, the FCC imposed its first explicit requirement that telcos supply MCCs with dial-up access interconnection to the landline network.[16] Specifically, wireline carriers were required to offer the non-wirelines the same type of interconnection, at the same tariffs, and with access to the same discounts, as they offered to their own mobile service affiliates.[17] The Commission also announced other detailed requirements aimed to ensure "that a balance be established so that the wireline company will not be in a position, because of its control over dial access interconnection, to claim or enjoy advantages not available to the [non-wirelines]."[18]

These interconnection requirements have been fully extended to other mobile services.[19] And to ensure that the equal interconnection requirements can be readily enforced, the Commission has required wireline cellular companies to operate as fully separate subsidiaries, noting that this would "greatly simplif[y] the opportunity of other cellular operators to gain interconnection rights to the landline network on the same basis

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FCC decided to permit non-wirelines to develop and operate cellular systems, though, at that time, the FCC still planned to authorize only one such system per service area. An Inquiry Relative to the Future Use of the Frequency Band 806-960 MHz, 51 F.C.C.2d 946, 948, 953-954 (1975). Then, in 1981, when it first authorized the commercial use of cellular communications, the Commission resolved to continue its dual licensing, competitive scheme for the new cellular services. The FCC declared it would license two cellular systems, designated as Block A and Block B. Wirelines would be assigned one block, non-wirelines the other. 86 F.C.C.2d at 476, 482-483.

[15] 98 F.C.C.2d at 198.

[16] 12 F.C.C.2d at 846. In its 1949 order establishing a dual licensing system, the FCC had left open whether it would require the telephone facilities to interconnect with MCC facilities. 13 F.C.C. at 1229.

[17] 12 F.C.C.2d at 849-850.

[18] *Id.* at 850. The Second Circuit relied on these requirements in upholding the FCC's decision to permit wireline carriers to provide mobile services. 409 F.2d at 327. The court noted that the FCC's conditions on the wirelines were "designed to obviate any advantages that may accrue and equalize the competitive situation." *Ibid.*

[19] *See, e.g.*, 86 F.C.C.2d at 485-486 (requiring interconnection for cellular systems).

as the telephone subsidiary * * *."[20] The Commission recognized that the details of interconnection would depend on the cellular system's design, and it therefore initially declined to designate the specific types of interconnection that should be used or offered.[21] But it did nonetheless establish general guidelines for wirelines to follow.[22] Several subsequent Commission orders, including two rulings in 1982,[23] one in 1987,[24]

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[20]*Id.* at 494. In 1982, the Commission reaffirmed separate subsidiary requirements for AT&T, but eliminated them for others. An Inquiry Into the Use of the Bands 825-845 MHz & 870-890 MHz for Cellular Communications Sys., 89 F.C.C.2d 58, 77-80 (1982). The separate subsidiary requirements were extended to the divested Bell companies in 1983. Policy & Rules Concerning the Furnishing of CPE, Enhanced Servs. & Cellular Communications Servs. by the BOCs, 95 F.C.C.2d 1117 (1983).

[21]86 F.C.C.2d at 496.

[22]The FCC stated that interconnection arrangements should be "reasonably designed so as to minimize unnecessary duplication of switching facilities and the associated costs * * *." Furthermore, while "[t]he particular arrangements involved in interconnection of a given cellular system should be negotiated among the carriers involved and be made the subject of an intercarrier agreement," the FCC stressed that it expected "all telephone companies to furnish appropriate interconnection to cellular systems upon reasonable demand * * * and upon terms no less favorable than those offered to the cellular systems of affiliated entities or independent telephone companies." 86 F.C.C.2d at 496.

[23]89 F.C.C.2d at 80-82; An Inquiry Into the Use of the Bands 825-845 MHz & 870-890 MHz for Cellular Communications Sys., 89 F.C.C.2d 571, 576-577 (1982). To give "practical effect" to a non-wireline carrier's right to equal connection, the FCC modified its application process to require any wireline carrier applying for a cellular system in an area where it is also providing landline service to set forth in its application exactly how its system will interconnect with the landline network. If a license is granted to a wireline carrier for a cellular system serving the same area as its landline system, "the license will be conditioned on the carrier providing a competing cellular operator the option of obtaining interconnection in the manner set forth in its application." 89 F.C.C.2d at 81-82.

Where a non-wireline carrier seeks interconnection arrangements different from those specified in the application of a wireline carrier, the non-wireline applicant may negotiate other interconnection arrangements with the wireline carrier. "This will assure," the FCC explained, "that non-wireline carriers will not necessarily be locked into the specific interconnection arrangements requested by a wireline carrier. Thus, it provides the flexibility necessary in a dynamic technological environment such as cellular." 89 F.C.C.2d at 82. The Commission also explained that it expected wirelines to provide non-wireline licensees with reasonable and appropriate interconnection negotiated between the parties even in areas where the local landline telephone company did not apply for (or receive) cellular service. *Id.* at 81 n.41.

[24]The Need to Promote Competition & Efficient Use of Spectrum for Radio Common Carrier Servs., 2 FCC Rcd 2910 (May 18, 1987). The Commission here allowed telcos six months within which to provide non-wireline mobile carriers with a requested "type 2" interconnection. *Id.* at 2914. (Type 2 interconnections are either done through a central switch that functions like a class 5 switch in a landline telephone system or through an access tandem.) The Commission advised all cellular carriers to file complaints if they believed a telephone company unreasonably delayed the interconnection or charged an unreasonable amount. *Ibid.* After receiving a complaint, the FCC noted that it would require the telephone company to justify its delay or to show that its rates were reasonable. *Ibid.* The Commission also required that interconnection negotiations be conducted in good faith. *Id.* at 2912-2913.

and one in 1989,[25] have reaffirmed and expanded upon these interconnection requirements.[26] Current FCC regulations require that any telco affiliate applying for a cellular license must attach to its application "an exhibit indicating exactly how its proposed system would interconnect with the landline network. This information must be of sufficient specificity to enable a potential competitor to design its system to connect with the landline system in exactly the same manner if the competitor so chooses."[27]

The precise terms and technical conditions of interconnection between the landline network and the burgeoning mobile network were still evolving as late as 1987, and these matters were still subject to more than occasional dispute at that time. Those disputes have since been almost completely resolved. It is now uniformly accepted, for example, that all cellular carriers are entitled to type 2 interconnection with the landline network,[28] and there is absolutely no dispute that telco-affiliated mobile carriers must pay precisely the same interconnection and access charges as independents. In short, the maturing of the industry, together with the FCC's regulatory efforts, have virtually eliminated the interconnection disputes that were still common some years ago.[29]

Competitive Oversight. The FCC has continuously monitored mobile markets to ensure that they do not coalesce into monopolies. In a 1988 order, for example, the

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[25]The Need to Promote Growth & Efficient Use of Spectrum for Radio Common Carrier Servs., 4 FCC Rcd 2369 (Mar. 15, 1989).

[26]The FCC requirements have been duplicated by the decree court. The court initially decided not to require the RHCs to grant all mobile carriers equal access to the landline network. United States v. AT&T, 552 F. Supp. 131, 196 n.269 (D.D.C. 1982). Just one year later, however, the court reversed its position when it granted the first waiver request for mobile services crossing LATA boundaries. United States v. Western Elec. Co., 578 F. Supp. 648, 651 (D.D.C. 1983). In granting subsequent waiver requests, the court has reiterated those requirements. *See, e.g.*, Memorandum and Orders, United States v. Western Elec. Co., No. 82-0192 (D.D.C. June 20, 1986).

[27]47 C.F.R. § 22.913(a)(8).

[28]In a very few instances (in offices still served by crossbar switches, for example) technical and/or capacity considerations have limited or delayed the availability of some types of interconnection. Such limitations can sometimes be overcome by trunking mobile traffic to another location. In any event, radio carriers are offered the same type of interconnection, at the same price, whether or not they are affiliated with the local telco.

[29]In 1986, for example, Ohio was a center of vigorous interconnection disputes. *See* P. HUBER, M. KELLOGG & J. THORNE, GEODESIC NETWORK: 1987 REPORT ON COMPETITION IN THE TELEPHONE INDUSTRY 4.13 n.49 (1987) ("HUBER REPORT"). Recently, however, the regulatory commission in that state recognized the "willingness on the part of the local exchange companies to work with the cellular companies in developing [type 2] interconnection agreements." Application for Consent & Approval of a Cellular Tandem Interconnection Agreement Between Certain Wireline Local Exchange Carriers & Cellular Tel. Cos. Pursuant to Section 4905.31, Revised Code, 1990 Ohio PUC LEXIS 882, at *2 (Aug. 8, 1990). The disputes noted by the HUBER REPORT in Indiana have also been completely resolved. *See* 104 Pub. Util. Rep. 4th (PUR) 99, 110-111, 112-113 (July 15, 1989). In Wisconsin, the only other specific dispute mentioned in the HUBER REPORT, interconnection concerns have likewise been fully resolved.

Commission addressed the concern that AT&T or other telcos might eventually come to monopolize the provision of paging services.[30] "We expect the wireline carriers to * * * refrain from any unfair practices and specifically not to take or seek advantages from the fact that as common carriers they have ready access to the general public," the Commission declared. "Since we will retain at all times the power of the licensing function, we will have sufficient opportunity for appropriate scrutiny. We will in the exercise of our continuing regulatory authority inquire into any practices which may develop which appear to be unlawful, anticompetitive, or inimical to the public interest * * *."[31]

In 1981, the FCC addressed similar concerns that wireline companies would end up dominating the cellular market, and again it concluded that a properly monitored system of dual licensing made this an unlikely prospect.[32] The Commission has consistently barred any licensee from owning a significant interest in both spectrum blocks in the same service area.[33] It has also declared that it would delay acting on a wireline company's application if a wireline headstart seemed likely to harm competition.[34] And it has preempted state regulation of mobile services that might undercut competition.[35]

Finally, as discussed further in the concluding chapter of this report, the FCC has kept pace with the growth of competitive mobile markets with steady infusions of new frequency. In paging, as one observer reported in 1989, "[t]he FCC continues to open

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[30] 12 F.C.C.2d 841; *see also* 14 F.C.C.2d 269.

[31] 14 F.C.C.2d at 271. The Commission further explained:

> We have made available to wireline and non-wireline carriers the same number of frequencies; we insulated the non-wireline carriers from unfair practices; we retained the power of the licensing function to assure the adherence to the condition; * * * and each type of carrier is afforded an equal opportunity to compete. Under these circumstances, absent some specific showing there is no basis for us to assume that our rulemaking proceeding will result in the establishment of a coalition to suppress competition.

Id. at 273.

[32] 86 F.C.C.2d at 491.

[33] *See, e.g., id.* at 492.

[34] 12 F.C.C.2d at 851; *see also* 86 F.C.C.2d at 492-493.

[35] *In re* Preemption of State Entry Regulation in the Pub. Land Mobile Serv., 58 Rad. Reg. 2d (P & F) 1518, 1524-1526 (Mar. 31, 1988). The FCC originally purported to preempt any and all state regulation of mobile services, including intrastate mobile services. The D.C. Circuit vacated the Commission's order, holding that the FCC had exceeded its statutory authority by preempting state entry regulation of the "common carrier aspects" of intrastate mobile services. NARUC v. FCC, No. 88-1205 (D.C. Cir. 1987) (unpublished *per curiam*). Thus, the states are only precluded from interfering with competition in interstate mobile services.

up new frequencies to support the [growing] demand, and encourages competition."[36] Another notes that the Commission has systematically encouraged growth of the industry by "[a]llocating additional radio channels to * * * paging services * * *, [a]uthorizing radio broadcasters to use [FM] subcarrier radiations [for] paging," and "[r]emoving the 'fence' between telephone company and nonwireline frequency allocations, thereby giving all carriers access to unused radio channels * * * for commercial exploitation."[37] Similar policies are now being shaped for the burgeoning cellular industry. As discussed in more detail in the final chapter of this report, the FCC continues to open new opportunities for competition in mobile communications. New frequency is being made available to serve new demand,[38] and radio services previously licensed for other purposes are being given new freedom to compete in the cellular market.[39]

Competitive Terms, Conditions, and Prices. These procompetitive policies have made it unnecessary to regulate most other aspects of radio services. The rates, revenues, and profits of radio service providers are subject to no federal regulation,[40] and half of the states do not regulate cellular or paging providers at all. Most states that do regulate such services do so only to a very limited extent, requiring such things as informational tariffs, and typically imposing no price regulation at all at the retail level.[41] The competitive policies implemented upstream, in allocating licenses and overseeing equal interconnection with the landline network, make additional regulation unnecessary.

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[36]Kirven, *Radio Paging Still Hot: An Old Familiar Way to Keep in Touch Has Gotten Even Better*, ELECTRONIC MESSAGING, Aug. 1989, at 34.

[37]Bean, *Paging Outlook 1990*, TELOCATOR, Jan. 1989, at 25.

[38]For example, in 1989 the FCC allocated an additional 10 megahertz of spectrum for cellular systems. Amendment of Parts 2 & 22 of the Commission's Rules Relative to Cellular Communications Sys., 2 FCC Rcd 1825 (Sept. 19, 1989).

[39]The FCC recently authorized a dispatch company, Fleet Call, Inc., to provide "enhanced specialized mobile radio service" over its SMR channels, and made clear that it would approve similar applications in the future. Thus, Fleet Call can provide a "new private land mobile radio system that promises improved spectrum efficiency without requiring additional spectrum." *In re* Fleet Call, Inc., 68 Rad. Reg. 2d (P & F) 1301 (Mar. 14, 1991).

[40]*In re* Revision of the Uniform System of Accounts and Financial Reporting Requirements for Class A & Class B Tel. Cos., 60 Rad. Reg. 2d (P & F) 1111 (May 15, 1986). If there is any vestige of price regulation here, it is on the long distance service, not on the mobile service. For example, intrastate toll calls, whether intra or interLATA, continue to be regulated by state public utility commissions. Some PUCs have attempted to regulate rates for intrastate, long distance cellular calling as well. *See* Lanning, *N.C. Commission Probes Central Cellular*, TELEPHONY, June 4, 1990, at 10.

[41]*See, e.g.*, TELOCATOR, REPORT ON STATE REGULATION OF COMMON CARRIER PAGING COMPANIES (Jan. 1, 1991); CTIA, STATE BY STATE REGULATORY UPDATE (June 1990); NARUC, NARUC ANNUAL REPORT ON UTILITY & CARRIER REGULATION 646 (Dec. 31, 1989).

For precisely the same reasons, the FCC has never imposed equal access requirements on any providers of radio services; indeed, it has never imposed equal access requirements *within* competitive markets of any kind. Thus, mobile providers, for example, have never been required by the FCC to give their customers 1+ access to the long distance carrier of their choice. Nor have mobile providers been required to offer, say, answering services equal access to the mobile switch. Nor has there ever been much concern about preventing any class of providers of radio services from manufacturing either terminal or switching equipment.

Divestiture Decree Restrictions

A completely different set of policies and requirements has evolved under the divestiture decree. It was decided early on that despite the overarching objective of divesting competitive from monopoly operations, the RHCs would be permitted to continue offering radio services of all types, because (at least at the time) such services appeared to fall largely within the decree's definition of "local exchange" operations.

There were two logical implications of that decision. On the one hand, the RHCs were *not* (at least initially) required to offer equal interconnection to competing providers of radio services: the divestiture decree accepts the monopoly provision of "local exchange" services and therefore does not require equal interconnection of competing "local exchange carriers." On the other hand, "local exchange" radio services offered by RHC affiliates were subject to all of the decree's line-of-business restrictions -- no "interexchange" or "information" services could be offered by RHCs in conjunction with their radio services, nor were RHCs permitted to manufacture equipment used in radio telecommunications.

The MFJ regime stands in sharp contrast with regulatory policies established by the FCC long before divestiture. The FCC had defined the outer margins of monopoly service at the level of telco *end offices*, and had regulated accordingly. The divestiture decree lumped together radio and landline services, and attempted to impose access policies and line-of-business restrictions at LATA boundaries, the periphery of the "Local Access and Transport Areas." The decree does permit RHC affiliates to package radio services with customer equipment like beepers or cellular phones. But it does not permit those same affiliates to manufacture the equipment in question, nor to market or provide interLATA circuits of any kind, including those needed for basic intersystem coordination.

Thus, except in those limited areas where the decree court has granted interLATA waivers, all interexchange calls must be delivered to an unaffiliated, "presubscribed interexchange carrier" ("PIC") designated by the radio services customer.[42] Unlike the

[42]Similar requirements have not been preserved for paging services, however. The decree court granted a number of specific geographic waivers permitting the RHC affiliates to provide interLATA one-way paging; and, although each of these orders required the RHCs' operating companies to provide equal interconnection to the landline exchange, none of them required the affiliated paging provider to offer equal access at the level of the mobile switch. *See, e.g.*, Order ¶ 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C.

companies they compete with, RHC mobile affiliates may not arrange with a particular interexchange carrier to provide discounted service to their customers; nor may they provide expanded geographic coverage across LATA boundaries. The decree court has repeatedly ruled that equal access requirements applied to bottleneck landline exchanges also apply to competitive mobile exchanges, and even to mobile exchanges that are out of region.[43]

The decree court has also attempted to graft various equal access principles in some (but not all) intersystem operations. In a September 1990 ruling, for example, the court permitted RHC affiliates to offer automatic call delivery to their customers, but only by means of (by then outdated) wide-area paging, and only on the condition that the call be carried by an interexchange carrier designated in advance by the customer.[44] The court did permit the RHCs to provide intersystem handoff to their customers without an equal access condition because "referral of the calls back to the customer's inter-exchange carrier * * * is not feasible at this point, and * * * imposition of an equal access condition would defeat the purpose of the waiver requests."[45] But the court only

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June 20, 1986) ("Ameritech's operating telephone companies shall provide access to their affiliated providers of paging telecommunications on terms – including price – no more favorable than are offered to non-affiliates"). Instead, the court required the RHC affiliates to lease their interexchange links "from non-affiliated interexchange carriers on the same terms as such facilities are available to Ameritech's competitors." *Id.* ¶ 4. *See also* Order at 4-5, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Feb. 26, 1986); Order at 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. May 14, 1986); Order at 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Aug. 8, 1986); Order at 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Sept. 22, 1987); Order at 1-2, United States v. Western Elec. Co., No. 82-0192 (D.D.C. June 16, 1988).

In 1989, when the decree court granted complete geographic relief to RHC paging affiliates, it did so subject to the same terms and conditions. Memorandum and Order, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Feb. 16, 1989). Thus, the RHC paging affiliates may themselves perform wide-area paging using dedicated (albeit leased) circuits. A paging customer does not inform his wireline paging company that he wants his messages delivered across country via MCI or AT&T, or some preferred satellite. He simply buys paging service from the RHC affiliate (or its competitor) and gets it delivered wherever he happens to be by the company providing him the service.

[43]*See, e.g.*, Order at 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Dec. 14, 1984) (permitting US West's affiliate, NewVector, to provide mobile services in the Gulf of Mexico provided that all such communications to and from the Gulf go through a cell site in Venice, Louisiana and that NewVector "offer equal access through interconnection at Venice, Louisiana, to any interested interexchange carriers to carry the traffic to and from the LATA in which Venice, Louisiana, is located and beyond"). *See also* Order at 5, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Feb. 26, 1986) ("The equal access provisions of section II(A) and (B) of the Modification of Final Judgment shall apply to intrexchange telecommunications services outside of Pacific's region that are permitted under this waiver."); Order at 3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Mar. 13, 1986) (same for NYNEX resale of mobile services in Connecticut); Order at 2-3, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Apr. 11, 1986) (same for US West's provision of cellular services in San Diego).

[44]United States v. Western Elec. Co., 1990-2 Trade Cas. (CCH) ¶ 69,177, at 64,452 (D.D.C. 1990).

[45]*Ibid.*

granted a one-year waiver in order to determine whether "technology could be developed in the near future which would, for example, permit an MTSO to anticipate a call nearing its station so far in advance that it could hand the call to the customer's preferred interexchange carrier without any risk of disconnection."[46]

As discussed in chapter 2, this schism between FCC and divestiture decree policies has had the effect of retarding competition in the geographic scope of services provided. RHC affiliates have been prevented from -- or at least significantly delayed in -- meeting consumer demand, in resolving technical problems, and in realizing cost efficiencies; the hobbling of the RHCs has reduced the competitive pressure on other providers to do the same. As discussed in chapter 3, the other decree restrictions are having similar anticompetitive consequences. RHC customers suffer directly, as the RHCs are limited in their ability to match the competitive offerings of other providers. Other customers suffer too, because independent providers are relieved of the competitive pressure that the RHCs could and should provide.

The past decade of MFJ jurisprudence has gradually moved toward aligning the decree with the FCC's regulatory model. On the one hand, the decree court has used the waiver process to replicate FCC access regulation, effectively requiring RHCs to offer other radio carriers equal access at the level of end office exchanges. And at the same time, the decree court has progressively relaxed the line-of-business restrictions as applied to radio services.

The interplay between divestiture decree and FCC policies with respect to radio services has been unusual. The FCC's procompetitive policies were solidly established long before divestiture, and have been pursued without interruption or deviation ever since. It is antitrust policy that has migrated toward the competitive scheme developed and first implemented by the FCC. As the decree court itself has already recognized in its rulings on over 60 waiver requests, the decree's line-of-business restrictions have proved to be anticompetitive, or at the very least unnecessary to protect competition, when mechanically extended from landline markets to the quite separate and highly competitive market for radio services.

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[46] *Ibid.* The waiver was subsequently extended for another year. Memorandum, United States v. Western Elec. Co., No. 82-0192 (D.D.C. Sept. 6, 1991).

1. COMPETITIVE MARKETS

G.M. Marconi's original plan was to use radio as a mobile telephone on sea going vessels. For many years the radio was named for what it lacked -- the "wireless" -- and the emphasis was on developing it to sever telephony from the landline umbilical. The idea of using radio for broadcast entertainment came relatively late and may be regarded as merely a detour on the way towards a truly mobile telephone system.

Radio's first land telecommunication use in the United States was by the Detroit police department in the 1920s.[1] Uses for mobile telephony developed rapidly during World War II.[2] In 1945, the FCC first allocated radio spectrum on an experimental basis to a broad range of private uses, including a general mobile radio service.[3] The first true mobile telephone service with connections to the landline network was introduced in 1946, but most mobile radio systems of the day did not interconnect to the landline network at all.[4] In 1949, the FCC permanently allocated frequencies to mobile services.[5]

Pagers as we now know them evolved later. One-way signaling service to vehicles was offered by the Bell System on an experimental basis as far back as 1946, and thereafter extended to pocket-type receivers.[6] By one account, the first page was sent to a doctor on a New York golf course on October 15, 1950.[7] By another, paging was invented by the British to replace noisy hospital public address systems and was first used in St. Thomas Hospital in London in 1956.[8] The first units were the size of bricks, almost as heavy, and about as informative. There was no selective paging to an individual pager until 1965.[9]

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[1] *AT&T Consumer Products Supplies Buick with Mobile*, PR NEWSWIRE, Sept. 13, 1983.

[2] Rosenberg, *Mobile Telephones: No Place to Hide*, FIN. WORLD, Nov. 30, 1983, at 14.

[3] Allocation of Frequencies to the Various Classes of Non-Governmental Servs. in the Radio Spectrum from 10 Kilocycles to 30,000,000 Kilocycles, 39 F.C.C. 68 (1945); Allocation of Frequencies to the Various Classes of Non-Governmental Servs. in the Radio Spectrum from 10 Kilocycles to 30,000,000 Kilocycles, 39 F.C.C. 257 (1946).

[4] G. CALHOUN, DIGITAL CELLULAR RADIO 30 (1988).

[5] General Mobile Radio Serv. Allocation of Frequencies Between 25 & 30 Megacycles, 13 F.C.C. 1190 (1949).

[6] Amendment of Part 21 of the Commission's Rules With Respect to the 150.8-162 Mc/s Band to Allocate Presently Unassignable Spectrum to the Domestic Pub. Land Mobile Radio Serv. by Adjustment of Certain of the Band Edges, 12 F.C.C.2d 841, 845, *reconsideration denied*, 14 F.C.C.2d 269 (1968), *aff'd sub nom.* Radio Relay Corp. v. FCC, 409 F.2d 322 (2d Cir. 1969).

[7] Peterson, *Paging Progress*, COMPUTERWORLD ON COMMUNICATIONS, May 2, 1984, at 71.

[8] Purton, *From a Quiet Beginning Paging Finds New Fields*, THE TIMES, Feb. 19, 1990.

[9] Peterson, *Paging Progress*, COMPUTERWORLD ON COMMUNICATIONS, May 2, 1984, at 71.

Since those early days, mobile telephony has developed into a multi-billion dollar industry that is helping to shape the way people work, where they live, and how they spend their leisure time. Mobile telephony bids fair to exert as great an influence on modern life as the wireline telephone itself did. Despite the recent schism between FCC regulatory policies and the consent decree, competition in the provision of mobile services has flourished. The markets have been characterized by burgeoning demand, rapid reductions in price, and steady improvement in service quality and coverage.

Paging

In the past decade, the FCC has steadily increased the amount of spectrum allocated to paging services. TABLE 1.1. The number of pagers in use nationwide grew from about 1 million in the late 1970s, to 2.2 million in 1983, to about 10 million in 1991; a projected 12 million pagers will be in use by 1994.[10] FIGURE 1.1. Revenues have grown apace, almost tripling in the years since the Bell System divestiture. FIGURE 1.2. Telocator Network of America, a mobile communications industry trade association, notes that "growth [in the paging industry] remains robust – in excess of one million pagers per year."[11] Telocator expects that "the current growth trends will continue."[12] The current growth rate for paging as a whole (local, wide-area, and national) is about 15 percent per year.[13]

The fastest growth of all has come from wide-area paging services, which provide regional coverage; these services have accounted for about one-third of all growth in the industry since 1985, with annual growth rates ranging from 20 to 30 percent. TABLE 1.2. In 1989, one observer noted that established regional operators were vying with new nationwide providers to provide intercity paging service; the competition was described as "intense."[14]

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[10] *U.S. Paging Market Forecast to Grow by One-Third in Four Years*, FIN. TIMES LTD., Apr. 11, 1991. More optimistic projections estimate 20 million pagers will be in used by 1993. Borowsky, *Memphis on Short List for 300 – Job Relocation*, MEMPHIS BUS. J., Jan. 28, 1991, at 1. Typical subscription fees are about $20 to $25 a month for local service; $35 a month for regional service; and about $65 a month for national coverage. Abrahms, *Mid-Atlantic Paging Stretches Network From Virginia to Boston*, WASHINGTON BUS. J., Sept. 17, 1990, § 1, at 23; Richards, *Pager Companies Count on Masses to Answer Call of Cheaper Fees*, USA TODAY, Sept. 5, 1990, at 6B; Wood, *There's No Escaping Beepers*, CHICAGO TRIBUNE, Mar. 18, 1990, at 20; EMCI, THE STATE OF THE U.S. PAGING INDUSTRY – SUBSCRIBER GROWTH, END-USER AND CARRIER TRENDS: 1990, at 32-33 (1990); *Paging Industry Breaks 10 Million Subscriber Mark*, PR NEWSWIRE, May 12, 1991.

[11] Roscoe & Wysor, *Survey Shows Strong Growth in Paging Industry*, TELOCATOR, June 1990, at 14.

[12] *Ibid.*

[13] Feldman, *Beeper Company Sends Stronger Signal*, CRAIN'S N.Y. BUS., Aug. 6, 1990, at 3.

[14] Bean, *Paging Outlook 1995*, TELOCATOR, Jan. 1989, at 29.